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(74) Agent and/or Address for Service Bromhead and Co., 30 Cursitor Street, Chancery Lane, London EC4A 1LT.

(54) **Dampers for ventilation ducts**

(57) In a damper 10 comprising a set of substantially parallel blades which are rotatable about longitudinal axes to open or close an opening or passage through the damper, the blades are driven *via* a gear box containing two meshing gear wheels connected to the shafts 16 of two of the blades and to a spring powered actuator, the gear box being mounted behind a cover 26 externally of the casing of the damper 10 so as to be readily removable therefrom. Movement of a pivotted member 30 to the left causes the actuator to rotate the gear wheels and open the blades but upward movement of the release member 54 allows compression springs (24) to operate the actuator so that the gear wheels are rotated to close the blades.

A fusible metal element may be included in the blade operating mechanism to close the blades when the temperature rises above a predetermined level.

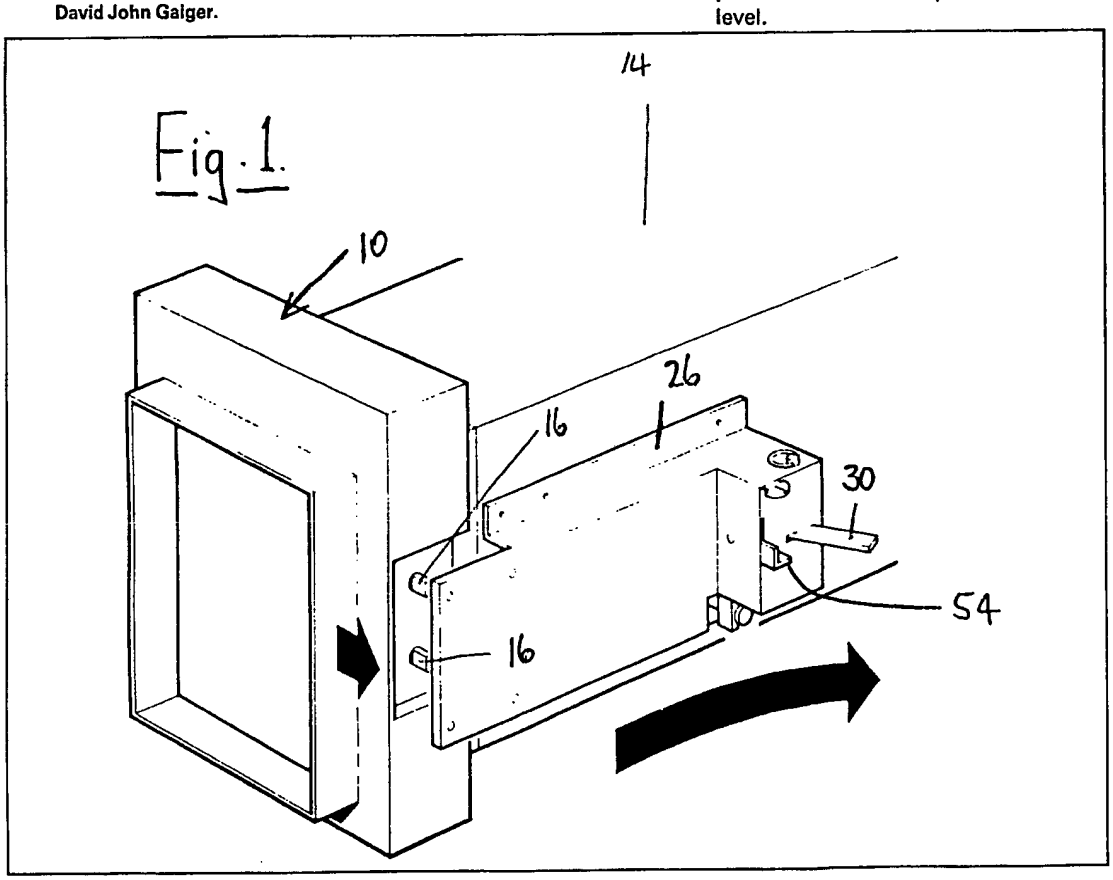

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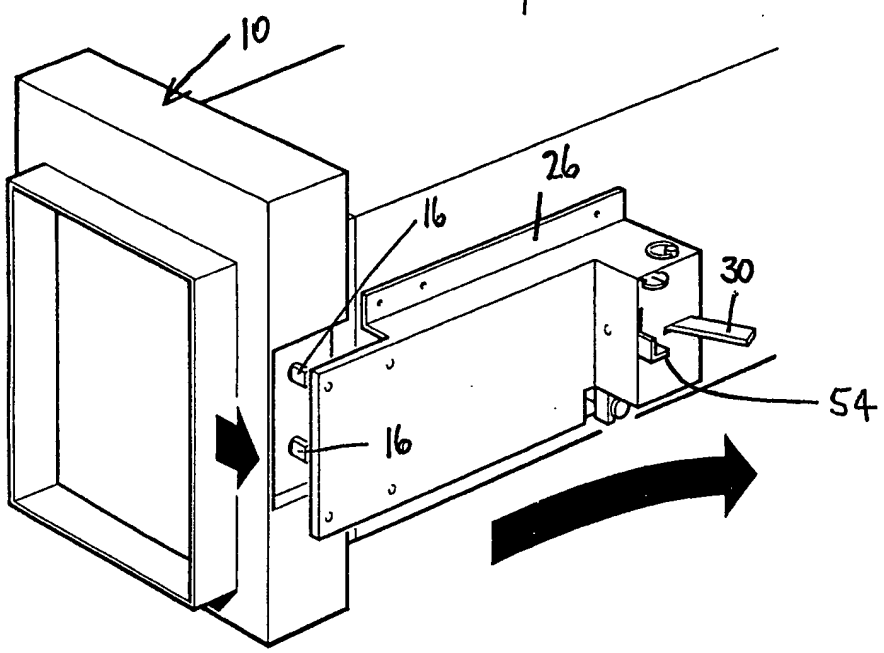
Fig. 1.



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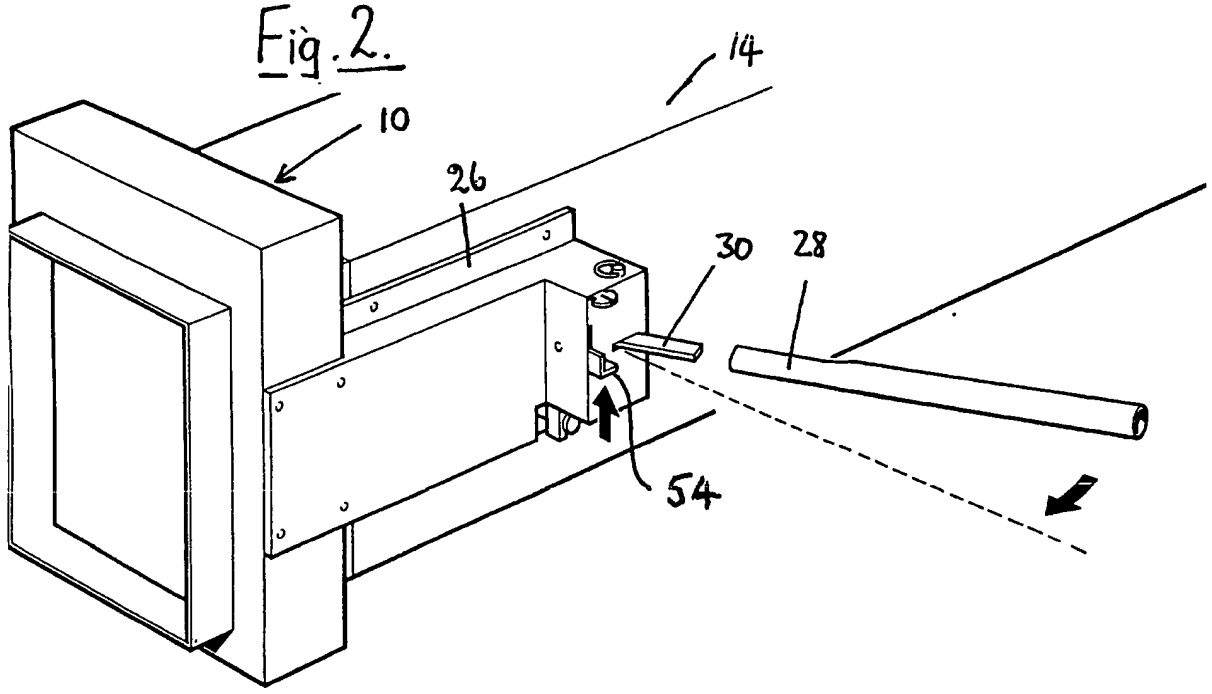

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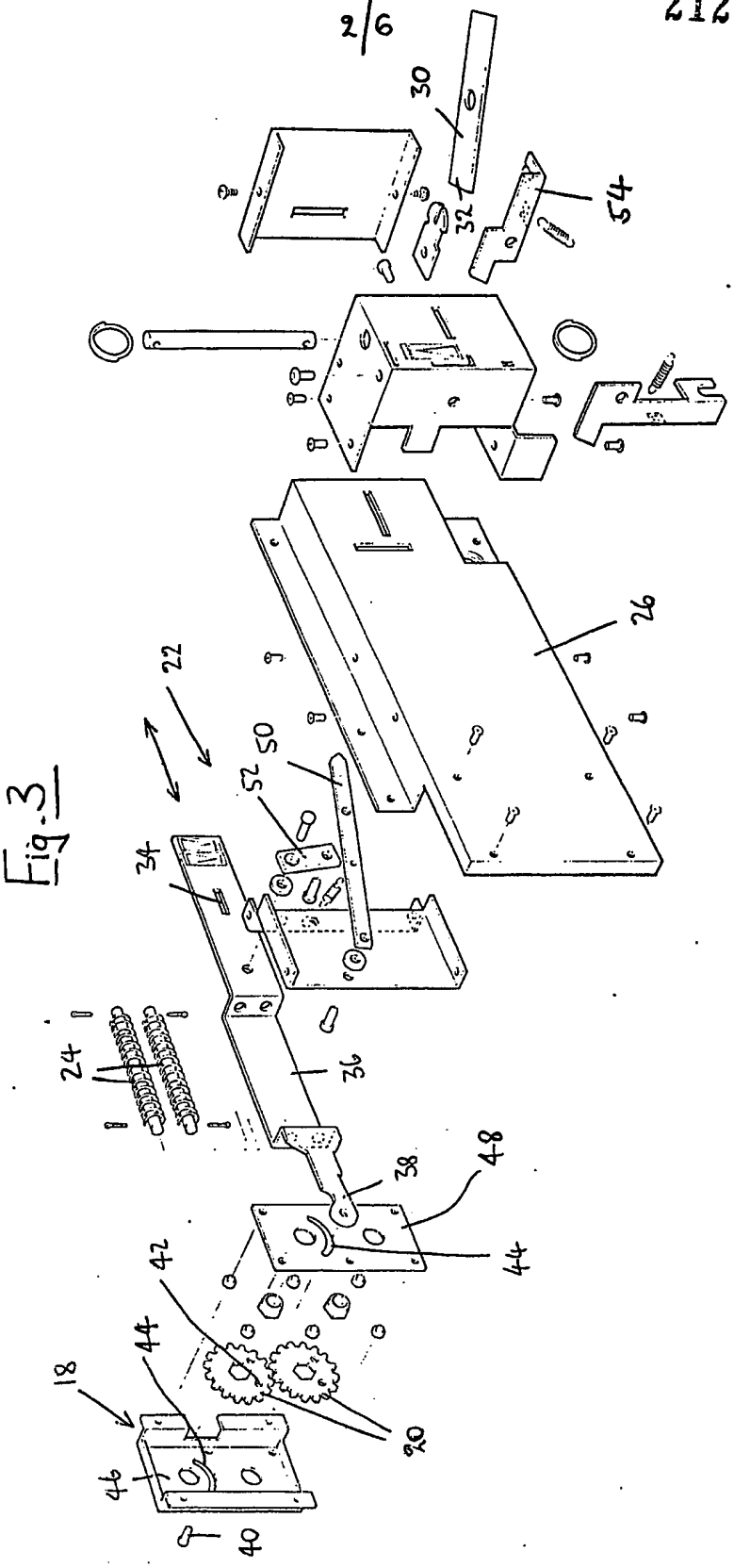

Fig. 3

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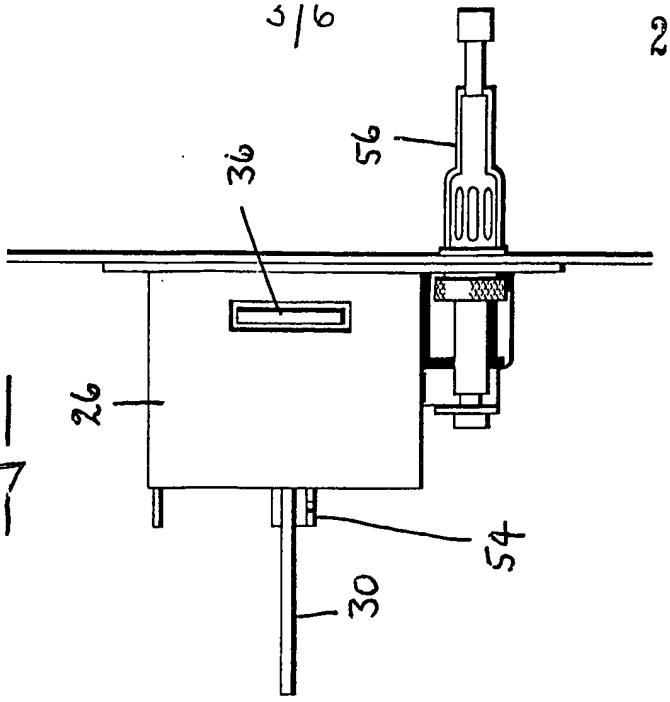

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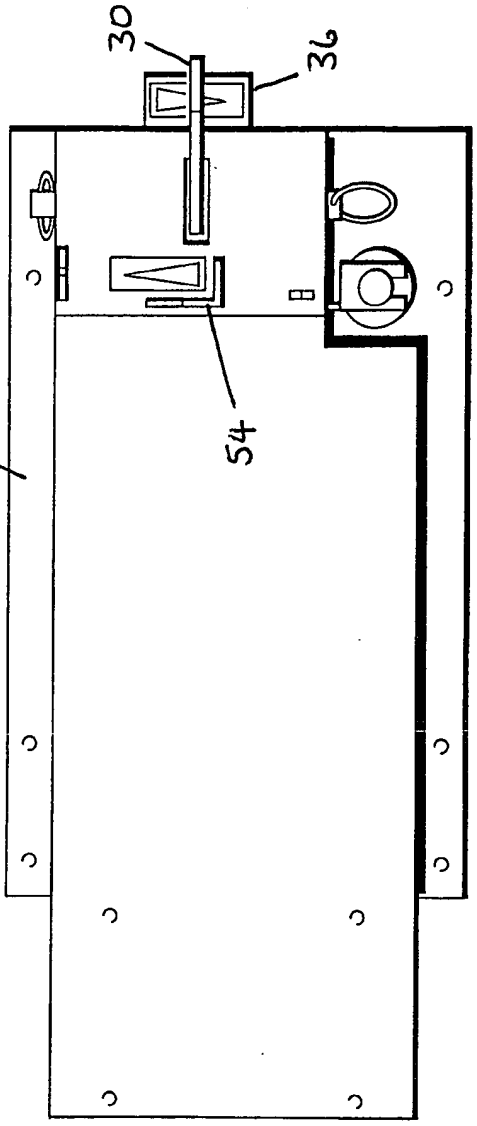

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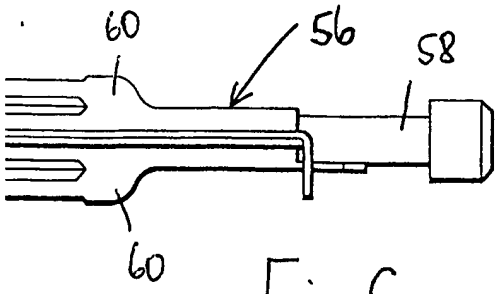

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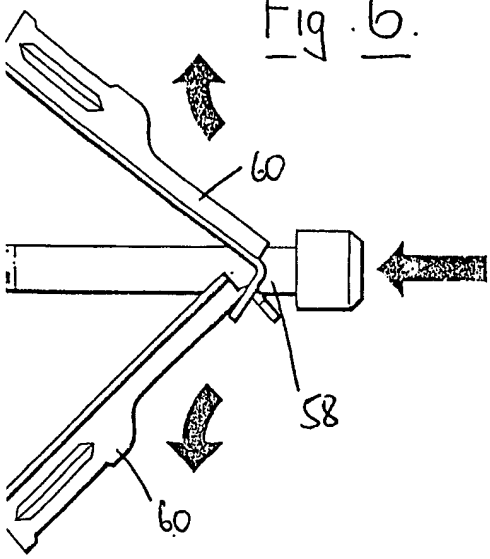


Fig. 7

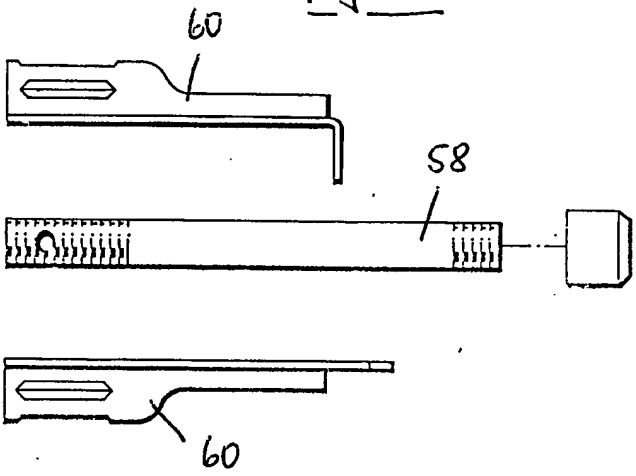
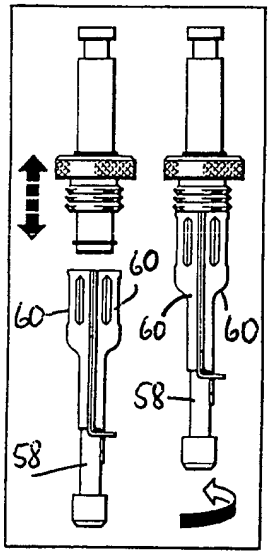


Fig. 8



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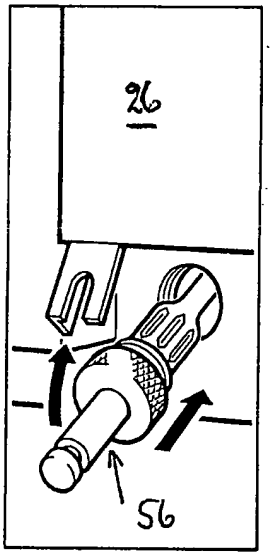
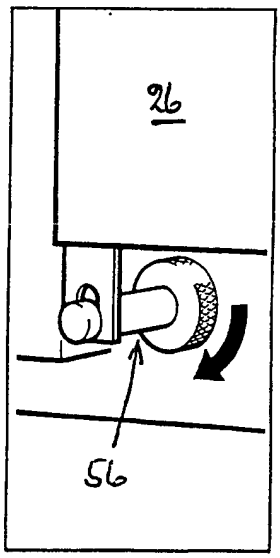


Fig. 10



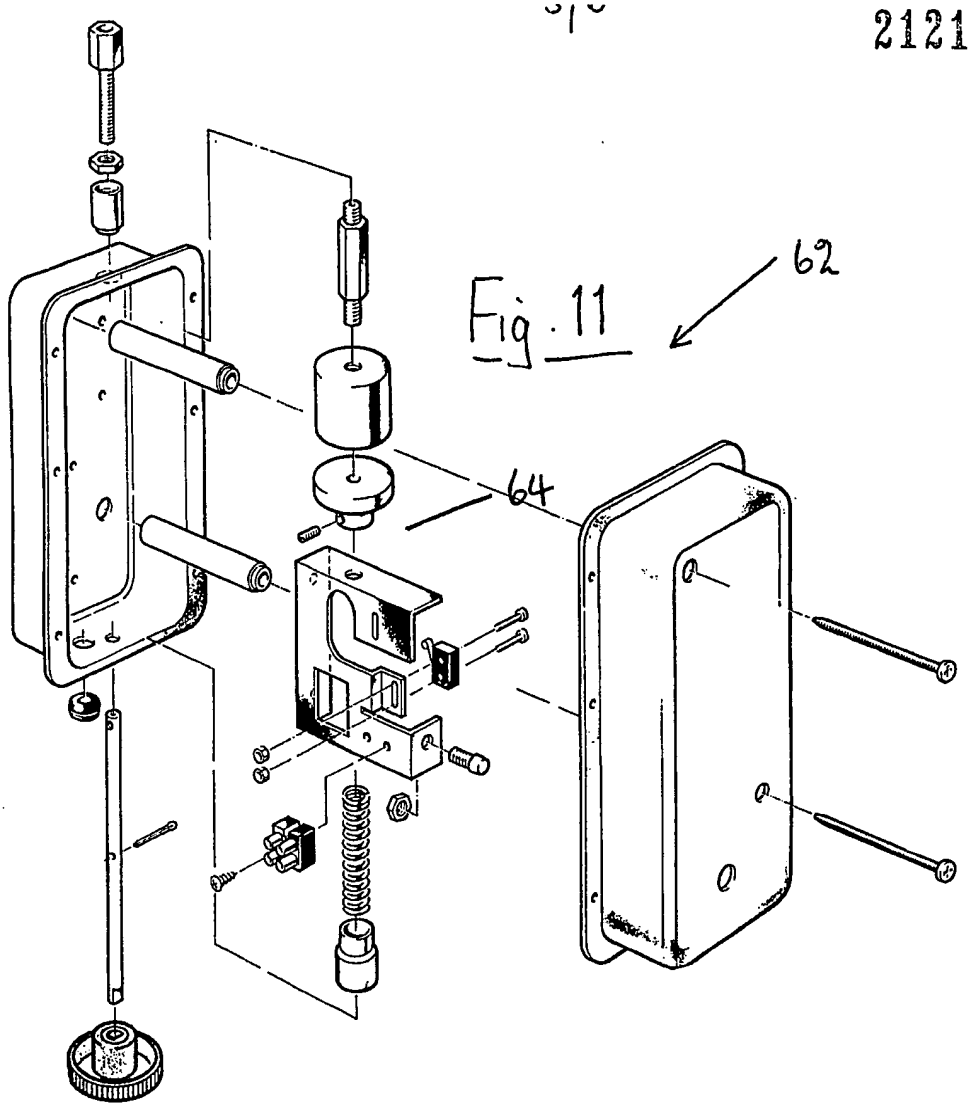


Fig. 11

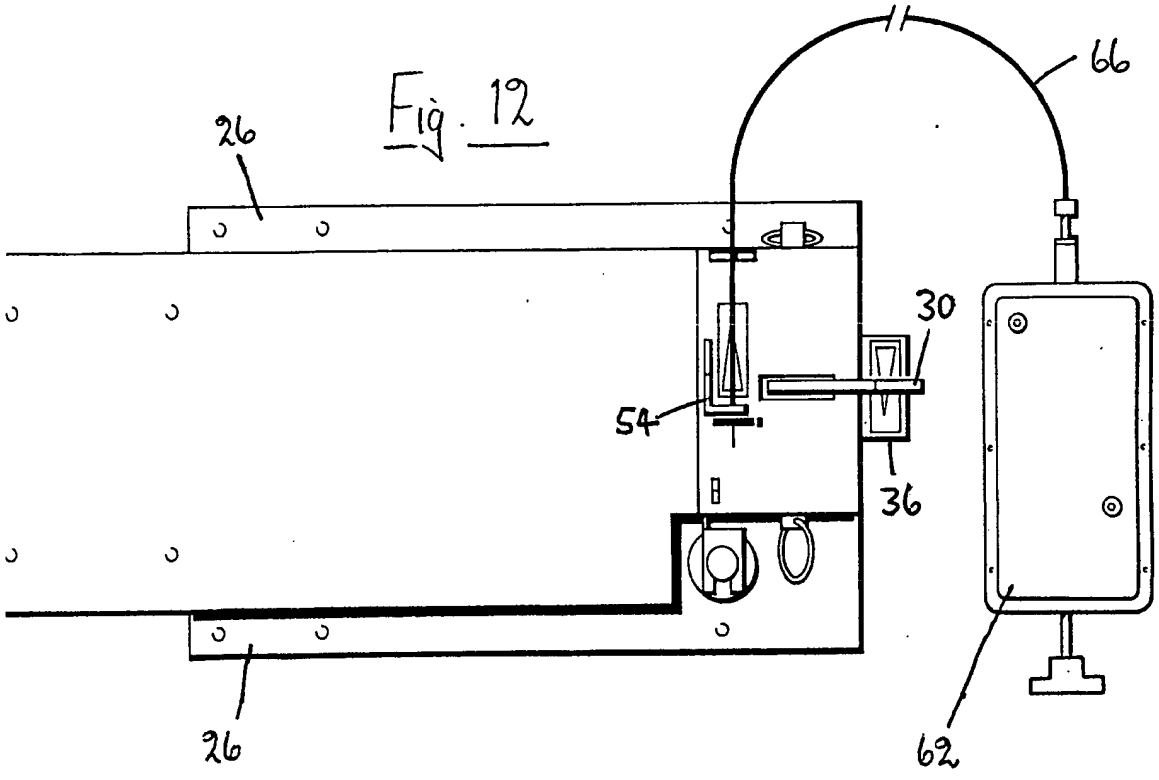


Fig. 12

Fig. 13

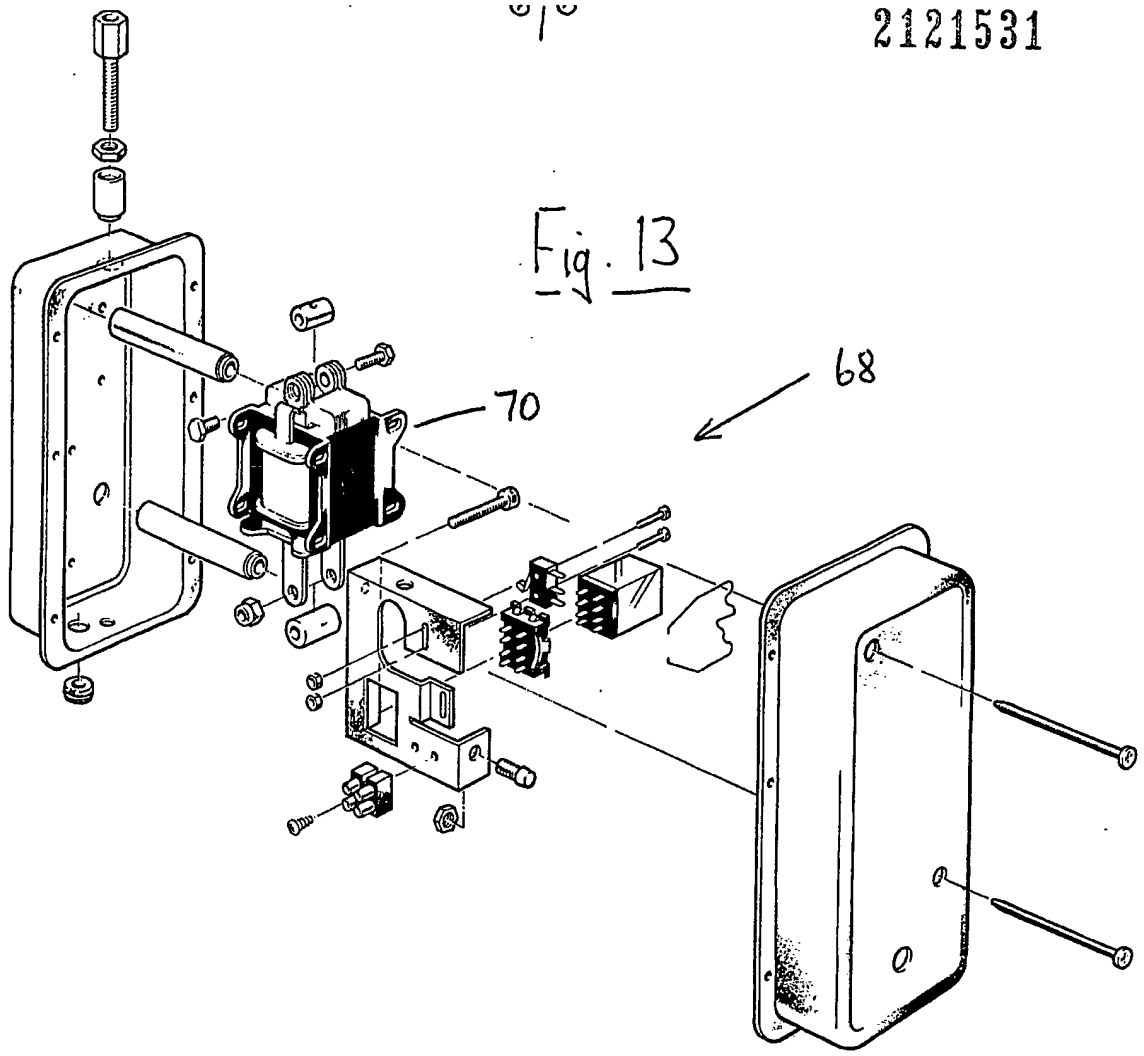
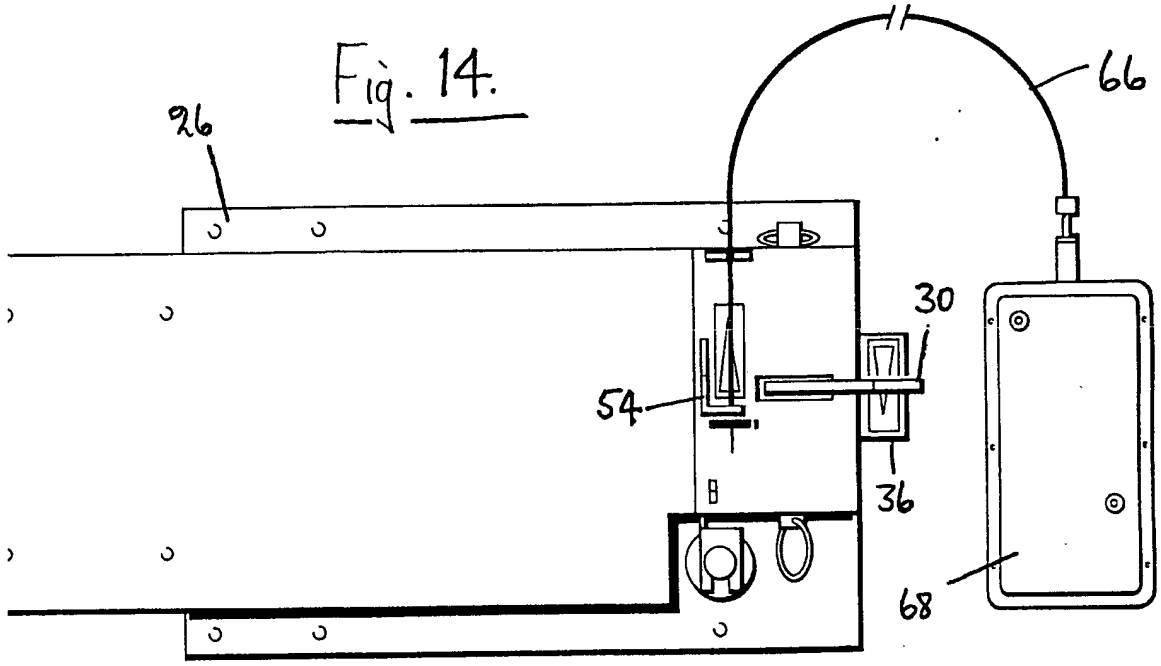


Fig. 14.



SPECIFICATION

Damper

This invention relates to dampers and is especially concerned with fire dampers, smoke dampers and combination fire and smoke dampers as used in the ducts of ventilation systems installed in buildings or ships.

In a number of prior Patents we have described dampers comprising a set of substantially parallel blades which are rotatable about parallel longitudinal axes to open or close an opening or passage through the damper. The blades are movable between their open and closed positions by some form of actuating means, it being preferred that spring-powered actuating means be used as such an actuator will operate irrespective of whether the electrical supply to the building or ship is cut off in the event of fire or other accident.

Where, as described above, the damper comprises parallel blades, which interlock with each other to close the passage or opening through the damper, it is convenient for a shaft at the end of each blade to be received in a disc located within a side compartment of the damper, the discs associated with the blades being interconnected by one or more longitudinal movable bars so that the discs move in unison with each other. The shafts of two of the blades extend into a gear box provided with two meshing gear wheels, and these two gear wheels are driven by the actuating means referred to above.

Hitherto the gear box has always been mounted within the damper casing and has not therefore been very accessible. This can be a disadvantage from the point of view of maintenance of the damper.

The present invention is accordingly directed to a damper comprising a set of substantially parallel blades which are rotatable about longitudinal axes to open or close an opening or passage through the damper, in which the blades are driven *via* a gear box mounted externally of the damper casing so as to be readily removable therefrom.

An example of a damper in accordance with the invention is shown in the accompanying drawings, in which -

Figures 1 and *2* are perspective views of the damper mounted in a duct, the actuating mechanism for the damper being mounted on the duct adjacent the damper;

Figure 3 is an exploded perspective view of the gear box used to drive the blade of the damper;

Figure 4 is a side view of the damper blade actuating mechanism where manual opening of the damper blades is desired;

Figure 5 is an end view of the mechanism shown in Figure 4;

Figures 6-8 are side views of the fusible element shown in Figure 5;

Figures 9 and *10* are perspective details illustrating the manner in which the fusible element is fitted on the actuating mechanism;

Figure 11 is a perspective exploded view of a control box incorporating an electro-magnet release operator;

Figure 12 is a side view of the actuating mechanism connected by a Bowden cable to the control box of Figure 11; and

Figures 13 and *14* are views corresponding to Figures 11 and 12 respectively illustrating the use of a control box having a solenoid release operator.

Figures 1 and 2 show a damper 10 installed in a duct 14, the duct forming part of a ventilation system installed in a building or ship. The damper is of the kind comprising a number of parallel blades which can be moved about longitudinal axes so as to open or close an opening or passage through the damper. The blades are not shown in the drawings but they will normally comprise stainless steel interlocking aerofoil blades.

At one end of each blade there is a shaft which is connected to a rotatable disc, the discs for the various shafts being located in a compartment on one side of the damper casing. Two of the shafts 16 (see Figure 1) enter a gear box 18 (see Figure 3) containing two meshing gear wheels 20 which are driven by a spring-powered actuating mechanism 22 to move the blades into their closed position. The same gear wheels are also used to open the blades against the action of the spring power which, in this instance, is provided by two helical compression springs 24.

Hitherto it has been the practice to mount the gear box within the damper casing so that it has not been very accessible. This has proved to be a disadvantage in practice, and the damper shown in the drawings accordingly has the gear box 18 mounted externally of the damper casing so that it can be easily removed or serviced. As will be seen from Figures 1-3, the gear box 18 and the actuating mechanism 22 are normally concealed from sight by a cover 26 which is rivetted or otherwise attached to the damper casing and to the duct 14.

Figures 1-5 illustrate a form of the invention in which the actuating mechanism 22 can be operated by a removable lever 28 (see Figure 2) so as to move the blades of the damper into their fully open positions. The lever 28 fits onto a pivotted member 30, the nose portion 32 of which enters a slot 34 in a link member 36 arranged for longitudinal movement in the direction of the arrows shown in Figure 3. The far end portion 38 of the link member 36 is connected by a pin 40 to one of the gear wheels 20, the pin passing through a hole 42 in the selected gear wheel. The pin also passes with clearance through two arcuate slots 44 provided in two opposing walls 46 and 48 of the gear box 18. Longitudinal movement of the link member 36 therefore causes rotation of the gear wheels about a limited arc governed by the arcuate slots 44.

Accordingly, by moving the lever 28 to the left in the direction of the arrow shown in Figure 2, the link member 36 is drawn to the rear so that the springs 24 lying adjacent its middle portion are compressed. As the link member 36 is drawn to the rear, a subsidiary lever 50 connected to it by a link 52 moves into a position where the blades are held in their fully open positions when the handle 28 has been moved fully to the left. If now a small release member 54 is moved upwards as shown in Figure 2, it releases the

lever 50 and allows the springs 24 to move the link member 36 to the left as shown in Figure 3 in order to rotate the gear wheels 20 and thus close the damper blades.

As will be seen from Figures 3 and 4, the end of the link member 36 nearer the slot 34 therein has indicating means to show where the blades are in their open or closed positions.

Figures 6-10 illustrate a fusible element 56 which is mounted on the actuating mechanism shown in Figures 1-5. The fusible element comprises a shaft 58 which is normally surrounded by two interconnected cover members 60, the two members 60 being soldered together or otherwise attached to one another by a fusible metal. The fusible element projects into the duct 14 and, when the temperature therein rises above a predetermined level, the fusible metal in the fusible element melts and allows the two cover members 60 to move apart as shown in Figure 6 so as to allow the shaft 58 to actuate the mechanism 22, thus causing the link member 36 to move to the left so as to close the damper blades. Figures 9 and 10 illustrate the simple manner in which the fusible element 56 is inserted on the actuating mechanism.

If desired, the damper blades can be opened through the use of a control box 62 which is shown in exploded view in Figure 11. This control box incorporates an electromagnet release operator 64 which is connected by a Bowden cable 66 (see Figure 12) so as to operate the release member 54 when the electro-magnet release operator is energised.

Figures 13 and 14 show an alternative form of control mechanism, Figure 13 showing in perspective view a control box 68 containing a solenoid release operator 70. This control box operates the actuating mechanism in the same way as the control box 62 shown in Figure 11, and for this purpose a Bowden cable 66 extends from the control box 68 as shown in Figure 14.

CLAIMS (Filed on 25th May 1983)

1. A damper comprising a set of substantially parallel blades which are rotatable about longitudinal axes to open or close an opening or passage through the damper, in which the blades are driven *via* a gear box mounted externally of the damper casing so as to be readily removable therefrom.

2. A damper according to claim 1, in which a shaft at the end of each blade is connected to a link element such as a disc located within a side compartment of the damper, the link members being interconnected by one or more longitudinally-movable bars so that the link elements move in unison with each other, and the shafts of two of the blades being arranged to extend into the gear box so as to be connected to two meshing gear wheels therein.

3. A damper according to claim 1 or claim 2, in which at least one gear wheel in the gear box is drivingly connected to power actuating means for the purpose of moving the blades from their open position to their closed position or *vice versa*.

4. A damper according to claim 3, in which the actuating means are spring powered.

5. A damper according to claim 3 or claim 4, in which the gear box and the actuating means are normally concealed from sight by a cover adapted to be attached to the damper casing and to the duct connected thereto.

6. A damper according to any one of claims 3 to 5, in which the actuating means are operable by a lever or other hand-operated member for the purpose of moving the blades of the damper into their fully open position.

7. A damper according to claim 6, in which the lever or other hand-operated member acts through the link member arranged for longitudinal movement, the said link member being connected to a gear wheel in the gear box.

8. A damper according to claim 7, in which the link member has indicating means to indicate whether the blades are in their open position or their closed position.

9. A damper according to any preceding claim having a fusible element adapted to initiate closing of the blades when the temperature around the fusible element rises above a predetermined level.

10. A damper according to any preceding claim, in which a control box incorporating an electrically-energised release operator is connected by a Bowden cable or the like to means for opening and/or closing the blads.

11. A damper substantially as described herein with reference to Figures 1 to 10 or modified by Figures 11 and 12 or Figures 13 and 14. of the accompanying drawings.

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